This case study reports results from a federally funded home telemedicine program in rural Grainger County, Tennessee. Patients, family caregivers, and providers were generally satisfied with this low-cost, user-friendly telemedicine program that used the plain-old-telephone system. Mileage and nurse drive time were reduced and nursing productivity was improved during this demonstration project.

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A Case Study of Benefits & Potential Savings in Rural Home Telemedicine

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The use of telemedicine in patients' homes has been increasing in the United States. One of the driving forces behind this increase is the need to provide high-quality, cost-effective care. Under managed care and capitated reimbursement systems, it has become necessary for home health agencies to control costs. Home telemedicine can provide some cost-cutting opportunities. In conjunction with on-site visits, telemedicine can provide the ability to assess the patient, monitor progress, and provide continuing education and support in the home environment.

To determine what some of the cost-cutting opportunities might be, this article reports initial findings from a case study of a telehome care demonstration project. UT Home Care Services, in cooperation with the University of Tennessee Medical Center (UTMC) Telemedicine Network at Knoxville, began providing telehome care in April, 1998 in a federally supported demonstration project. The project is funded through a federal grant awarded by the U.S. Department of Health and Human Services, Office for the Advancement of TeleHealth (formerly the Office of Rural Health Policy). This grant funds an integrated system of healthcare in rural Grainger County that includes not only home care but the operations of three rural telemedicine clinics as well. Federal funds for this 3-year project are $491,306 (42%) and $684,165 (58%) from matching funds. The direct cost for home care exclusive of nursing was 3% of the federal funds. This includes investment in the equipment for the homes; this equipment has a 3- to 5-year life span.

Home Touch™* equipment includes a video camera, video monitor, speakerphone, and an electronic interface to the standard home telephone line. This configuration has been developed by the UT Telemedicine Network to provide the highest function for the cost. At a cost of $1,500, this equipment provides the home health nurse with visualization quality good enough to see the creases in the palm of a hand and to see each unit mark on a 100-unit syringe. The system is easily used to visualize medications, wounds, and digital displays. Based on the potential travel costs saved per visit in this study, the investment per home is equivalent to about 30 visits. In addition to the video equipment, hand-held digital monitors such as a glucometer, sphygmomanometer, pulse oximeter, spirometer, scale, and thermometer can be used in the home. Operation of the video equipment is simple and the basics are learned by nurses in a day or less, with proficiency achieved after 1 week of training.

As of June 30, 1999, 444 telehome health visits were made for conditions ranging from congestive heart failure to diabetes management. Most of the teleconsultations have been for nursing assessments. However, there have been consultations with patients' primary care physicians as well. UT Home Care Services chose an interactive telemedicine system using the basic telephone system for several reasons:

- it requires low capital equipment costs,
- providers and patients find it easy to use, and
- it provided nurses with the quality of video necessary to assess and care for home health patients.

A typical nursing consultation involves calling home care patients at a scheduled time once or twice per week, depending on the patient's condition and plan of care. Patients and family caregivers have been trained to use the system—this involves turning on the power cord that connects

*Home Touch is a registered trademark of the University of Tennessee Medical Center (UTMC) at Knoxville.

the television and speakerphone. Depending on the patient's hearing capabilities, he or she will either use the speaker-phone or the phone receiver. The telemedicine nurse conducts a televisit appropriate to the plan of care. Both the nurse and the patient can see one another and the camera is movable so that various aspects and views of the patient can be visualized.

Purpose of Study

The purpose of the current study is to:

1. provide a brief overview of telemedicine and telehealth initiatives in the United States,
2. determine the advantages and disadvantages of telehome healthcare from UT Home Touch patients' and providers' points of view,
3. assess mileage and drive time savings,
4. compare findings of the Home Touch study with those from other research projects involving telehome healthcare.

Review of TeleHealth Activity

The use of telemedicine services (now becoming known as telehealth services) is growing.

Telehealth Facts:

1. In 1997, 139 programs performed more than 40,000 clinical consultations. (Telemedicine Today, 1999).
2. Home healthcare is among eight specialties that use telemedicine technologies. The top users in 1999 included, in order of frequency:
   - radiology,
   - dermatology,
   - cardiology,
   - psychiatry,
   - emergency care,
   - home health,
   - pathology, and
   - oncology (Dakins, 1999).
3. The top three reasons for using telemedicine include increased access to care, increased quality of care, and more efficient use of resources.
4. Telemedicine also is becoming widespread in Europe (Ostbye & Hurlen 1997).

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Types of Technology

Telemedicine is an integrated and "innovative system of care that can provide a variety of health and education services to clients unhindered by space and time" (Bashur, 1997). Healthcare providers and patients have been linked at a distance, as have providers to other providers for consultation. The technology involved in creating a telemedicine encounter ranges from the simple (e.g., telephone and fax equipment) to the complex (e.g., computer systems that rely on satellites or integrated digital networks) (Balas et al., 1997). A recent survey of research in telemedicine (Taylor, 1998) noted that services can be divided into three broad categories:

1. treatment services, such as tele-surgery;
2. diagnosis or management services, such as tele-consulting; and
3. informational or education services, such as a tele-clinic to promote smoking cessation.

Presently, a majority of telemedicine activity focuses on diagnosis and management services. Such activities include:

- tele-consulting, in which patients use the service to consult with a health care provider;
- tele-conferencing, in which clinicians consult with one another about a patient over a video link;
- tele-reporting, in which information about a patient is transmitted to a remote site (this is frequently called *store-and-forward technology*); and,
- tele-monitoring, in which information about a patient is collected continuously and analyzed at a remote site (Taylor, 1998).

Home-based telemedicine can involve tele-consulting, conferencing, reporting and transmitting. The telemedicine model used in this study is tele-consulting. The use of home-based telemedicine is expanding in the United Sates because "home telecare is feasible and patients like it" (Whitten et al., 1998). Whitten's research also reported that nurses and administrators suggested that the focus be on

telephone-based home telecare systems. Use of the "plain old telephone system" (POTS) is considered a low-bandwidth technology, but one that is proving to have broad applications for home care. Kinsella (1997a) noted that "home telecare visits are really a way of extending care delivered to the home by the in-person, on-site, hands-on nurse." Kinsella (1998) also noted that home telehealth care services bring information into the home (e.g., medication compliance reminders) and patient data from the home (e.g., vital signs that can be transferred to the healthcare provider).

Potential benefits reported by Hayes et al. (1998) include:

- fewer office visits for patients,
- improved confidence in treatment decisions, and
- improved documentation through the recording and transmitting of still images from the home.

Kinsella (1997b) noted that benefits in an HIV/AIDS program that combined telecare and traditional hands-on services included more efficient use of providers' time because participants spent less time with clinicians and because there were reduced hospitalizations.

> One can deduce that if home health agencies supplemented a percentage of their traditional in-home visits with a low-cost, user-friendly telehome health system, cost savings related to drive time and mileage reimbursement could be seen.

Research Outcomes

Researchers have reported both the advantages and disadvantages of home-based telemedicine. Researchers explored the management of chronic obstructive pulmonary disease patients in the United Kingdom through interactive video via the telephone (Mair et al., 1999). They noted that the telemedicine system enabled providers to complete symptom charts, assess oxygen saturation, assess peak expiratory flow rates (PEFR), and measure both temperature and pulse. This study also noted that both lighting and patient positioning were crucial factors in determining image quality. Some of the disadvantages included:

- a lack of consistency in establishing a video-link connection,
- variable picture quality, and
- some movement distortion because of transmission capacity.

The Harvard Telepsychiatry Project investigated the feasibility of videophone projects in home health settings (Cukor et al., 1998). Initial investigation found that the technology was "well accepted by patients, families, home care providers and supervisors. This experience confirmed the belief that augmenting usual home care with technology may result in equal clinical outcomes, at lower cost, (p.319)."

A variety of home health telemedicine projects are being conducted throughout the United States. A review of the research and applied projects presented at the 1999 American Telemedicine Association's Fourth Annual Meeting in Salt Lake City, Utah, found the following applications:

- blood glucose monitoring of diabetes from home (Aldoui et al., 1999);
- monitoring high-risk obstetric patients (Britton & Still, 1999);
- asthma tele-monitoring (Finkelstein et al., 1999);
- management of congestive heart failure (Kveder et al., 1999);
- hospice care (Doolittle et al., 1999; Mustaelski & Butler, 1999);
- special nursery care (Marinkovich, 1999).

Tele-rehabilitation is also being done in the home (Telehealth Magazine, 1999) as is emergency telehome care in Israel (Telemedicine Today, 1995).

Gustke and Josey (1999) noted that in their study of telehome healthcare in North Carolina there were both cost savings and quality improvements. They reported:

- a reduction in emergency room visits,
- reduced in-patient hospitalizations, and
- fewer long-term care placements.

They noted that telehome health would become increasingly attractive in a capitated environment.

Study Method

Patients were recruited to the Home Touch program based on referrals from physicians in UTMC's integrated health delivery network. Patient selection criteria involved meeting one or more of the following:

Clinical Indications:

1. Chronic disease
   A. Congestive heart failure

B. Chronic obstructive pulmonary disease
C. Diabetes
D. Cancer
2. Open Wounds
3. Parenteral/enteral therapies

Operational Indications:
1. Patients not requiring "hands on" care by the nurse for each visit
2. Patients requiring two or more visits per week
3. Patients with an unreliable caregiver
4. Patients with a history of poor compliance to instructions, medications, or treatments
5. Patients requiring follow-up observation of self/caregiver treatment performance

Utilization Indications:
1. Patients requiring frequent clinic visits
2. Patients with frequent emergency room visits
3. Patients with frequent hospitalizations for exacerbation
4. Patients initiating frequent telephone contact with home health office
5. Homebound patients with increased socialization

If a patient was referred, a home health nurse interviewed the patient and his or her caregiver to determine if the patient was interested in participating in the program. If there was interest, a signed Consent Form was obtained, giving Home Touch staff the ability to monitor patient reaction to the program and satisfaction levels. Visits by telemedicine usually occurred one or two times per week, although patients were instructed that they could contact the tele-nurse in addition to their scheduled visits.

The total census for Home Touch has been 14 patients between April 1998 and June 1999. This study reports data from biweekly tele-health encounters during this time period, patient reactions from satisfaction questionnaire and from in-depth, in-person interviews with most of these patients. Because of the small sample size, generalization is not possible. However, data gleaned from this study is useful because it is one of the longer tele-health studies involving a variety of patients, most of whom have chronic, long-term health problems that seem amenable to tele-health management.

Data were collected through three separate instruments. More than 400 telemedicine encounter sheets with comprehensive information about each consultation were analyzed. Monthly satisfaction questionnaires administered by the nurse over the telemedicine system or by follow-up phone call by an evaluation coordinator not employed by UT Home Health also comprised the data set. Additionally, the evaluation coordinator analyzed transcripts from audiotaped depth interviews with Home Touch patients. In-depth interviews are used in qualitative research to encourage an exploration of what a phenomenon means to individuals. In this study, it was important to give patients an opportunity to describe what kind of impact, if any, use of telehealth technology had in their lives generally and in the management of their illnesses specifically. The interviews typically lasted between 45 and 60 minutes, and were always conducted in patients' homes.

Results

Home Touch provided 444 telehome visits to 14 different patients between April 1998 and June 1999 (see Table 1). Of the 14 patients who were in the Home Touch program, five had been in the program for at least 6 months. Three patients had been in the program for 1 year. Two patients had terminal cancer and have since died. Two patients died in June; one was a double amputee diabetic who had heart failure and the other died of the complications of chronic obstructive pulmonary disease. These two nonhospice patients were stable, but both were severely ill when they were admitted to home health. Neither was expected to live a long time. Four patients had cancer (three lung and one breast). Three patients were being monitored for congestive heart failure and three for diabetes. One patient had emphysema, another hypertension. Two patients had strokes and one was being followed for management of a foot ulcer.

Of the 14 patients, 12 had a mix of traditional home health and Home Touch. Two patients had Home Touch care only because they were not strictly homebound but did require consistent assessment and monitoring because of medication mismanagement and frequent emergency room visits.

Eighty-six percent of Home Touch patients were Caucasian. One patient was African-American and another was American Indian. Nearly 75% of Home Touch patients lived in a two-person household, usually with a spouse. Sixty-four percent were retired and two patients were unemployed. Three women were homemakers. Sixty-four percent had not earned a high school degree. Three patients had completed some college.

Table 1: Home Touch Visits through June 30, 1999

Month/Year	Number of Patients	Patients' Primary Diagnoses	Average Tele-Visit Time (Minutes)	Driving Distance Saved (Miles)	Driving Time Saved (Minutes)	Total Tele-Visits
April 1998	2	DM, Pulmonary Embolism, Hospice-Lung Cancer	23.64	528	880	11
May 1998	5	DM, Pulmonary Embolism, Hospice-Lung Cancer (2) Emphysema	18.46	1,416	2,520	26
June 1998	5	DM, Pulmonary Embolism, Hospice-Lung Cancer (1), CHF (2), Emphysema	17.67	1,766	3,090	30
July 1998	4	DM, Pulmonary Embolism, Hospice-Lung Cancer (1), CHF (2)	15.96	1,546	2,590	26
August 1998	5	DM, Pulmonary Embolism, Hospice-Lung Cancer (1), CHF (2), Emphysema	18.96	1,412	2,280	24
September 1998	5	DM, Pulmonary Embolism, Hospice-Lung Cancer (1), CHF (2), Emphysema	18.17	1,752	2,980	30
October 1998	6	DM (2), Pulmonary Embolism, Sugar-Cushing Disease, CHF (2), Lung Cancer	13.86	1,428	2,050	22
November 1998	7	DM (2), Pulmonary Embolism, Sugar-Cushing Disease, CHF (2), Lung Cancer, Hypertension	15.87	1,956	2,890	31
December 1998	6	DM (2), Pulmonary Embolism, Sugar-Cushing Disease, CHF (2), Hypertension	12.96	1,428	2,170	26
January 1999	5	DM (2), Pulmonary Embolism, CHF (2), Hypertension	14.38	1,268	1,910	21
February 1999	6	DM (2), Pulmonary Embolism, CHF (2), Hypertension, COPD	15.6	1,428	2,250	25
March 1999	8	DM (2), Pulmonary Embolism, CHF (2), Hypertension, COPD, Urinary Retention, Breast Cancer	18.2	2,422	3,890	41
April 1999	8	DM (2), Pulmonary Embolism, CHF (2), Hypertension, COPD, Urinary Retention, Breast Cancer, Hospice-CHF, CVA	21.18	3,722	5,780	51
May 1999	7	DM (1), CHF (2), COPD, Urinary Retention, Breast Cancer, Hospice-CHF, CVA	15.94	2,358	3,700	42
June 1999	7	DM (1), CHF (2), COPD, Urinary Retention, Breast Cancer, Hospice-CHF, CVA	18.21	2,308	3,710	38
Total	2-8		17.47	27,276	43,560	444
Cost Savings			*27.6 min.	**$7,091.76	***$14,810.40	

Total Savings: $21,902.16/444 visits = $49.33 per visit

DM = Diabetes Mellitus; CHF = Congestive Heart Failure; CVA = Cerebral Vascular Accident; COPD = Chronic Obstructive Pulmonary Disease
*Average traditional, in-person home health visit is 45 minutes (45 min. - 17.4 min. = 27.6 min.)
**Mileage reimbursement in the agency is $.026/mile (27,276 miles x .26/mile = $7,091.76)
***Drive Time reimbursement in the agency is $0.34/min. (43,560 min. x .34/min. = $14,810.40)

Nearly 75% of patients reported having a combined household income of less than $20,000.

The majority of Home Touch providers were RNs, although a hospice supervisor, primary care physician, and a social worker had also begun using the system. Eight providers were female and two were male. Most providers were in the home health field. The average number of years of practice was seven. The types of services provided during Home Touch visits included, but were not limited to:

- assessment of pain control,
- physical assessment,
- wound assessment,
- monitoring glucose,
- monitoring vital signs,
- monitoring patient-controlled analgesic pumps, and
- medication management.

Benefits Articulated

Nine of 14 patients and caregivers were asked about their satisfaction with telemedicine and its perceived benefits via in-depth interviews and monthly surveys. Overall, patients perceived the following benefits:

- Increased sense of security that medical help is readily available.
- Increased and faster access to healthcare advice.
- Home Touch system very easy to use.
- Felt like they were in the same room as the nurse.
- Reduced pain that had been exacerbated by travel to the doctor/clinic.
- Reduced anxiety knowing that help was a videophone call away.
- Transportation and travel time savings.
- Access to transportation problems reduced.
- Didn't have to drive on dangerous rural roads, particularly at night and in winter.
- Reduced confusion over medication use.
- Time savings during the televisit.
- Increased sense of being in control.
- Increased personal attention from nursing staff because staff did not seem to be in a hurry to get to the next home visit.
- Increased privacy.
- Quality of care same as or better than an in-home visit.

Some of the disadvantages patients expressed related to occasional telephone connection problems. This technical problem was corrected in some cases by disabling the call-waiting feature of the patient's telephone system. Two patients also said that they missed having their lung sounds or blood pressures taken by an in-home nurse and that this was a disadvantage.

Family caregivers also were asked about the benefits and disadvantages of telemedicine. Overall, caregivers perceived the following benefits:

- Saved time in terms of transporting patient to doctor's office or clinic.
- Reduced anxiety, knowing that healthcare support was available.
- "Just-in-time" healthcare advice available.
- Added value of being able to visualize a problem, such as a wound.
- Reduced time to get medical help.
- More convenient than an in-home healthcare visit.
- Comprehensive, consistent care available.
- Increased privacy.

Providers said that tele-home health permitted long-term patient monitoring at lower cost and provided an opportunity for incremental health education.

Overall, providers perceived the following benefits:

- Patients were more focused on the nurse during instruction.
- Permits observation of caregiver performing treatments after on-site instruction.
- Permits monitoring of blood pressure and other vital signs visually.
- Could monitor family caregiver performance during wound care.
- Nurses could give immediate assessment when patient calls Home Touch.
- Could verify settings on in-home medical equipment.
- Increased ability to manage and establish medication routines for patient.
- Decreased in-home nurse visits.
- Travel time and mileage savings.
- Increased productivity.

Providers said that some of the disadvantages of telemedicine included problems with connections with a few patients whose telephone lines

seemed to have unexplained vulnerabilities. Additionally, lighting and patient positioning were crucial for good visualization and the lighting situation in some patients' homes was less than optimal.

Potential Travel Time and Mileage Savings

The number of Home Touch visits increased in 1999 (see Figure 1). The average Home Touch visit time per patient was 16.89 minutes in 1998 and 18.06 minutes in 1999. The average visit time in 1998 through June 1999 was 17.47 minutes. This 17-minute telehome visit figure is consistent with Kaiser Permanente (California) data that also reported an 18-minute average visit time for its home telemedicine system versus a 45-minute average visit time for a traditional in-home visit (Johnston, 1997). The difference between the telehome visit average time and the traditional home visit average time is approximately 28 minutes. Nurse productivity more than doubled during a home televisit. This productivity increase occurred in the presence of high levels of patient satisfaction (see Figures 2 and 3).

Potential cost savings include mileage and nurse drive time that was not spent traveling to homes. Because this was a case study of 14 patients, and because this demonstration study tried to determine the utility of visiting patients in the home by telemedicine, potential cost savings should be interpreted based on these facts. For example, some patients in the study may have had visits that would not be included in the traditional home visit reimbursement structure. However, one of the purposes of the federally funded study was to demonstrate the potential advantages and disadvantages of long-term monitoring of chronically ill patients in the home. Another purpose was to evaluate potential savings in a capitated payment system.

One of the advantages is a potential saving related to nurse drive time and mileage reimbursement. It should be emphasized that these were patients in rural areas where drive times are long and mileage reimbursement can be substantial. Use of the Home Touch program saved more than 27,000 miles for the 14 patients under study since April 1998. This represents potential savings of $7,091.76 (27,276 miles at $0.26/mile) in mileage in the 14 months since the Home Touch program began. Additionally, nurse drive time cost, had the nurse traveled to the homes, would have to-

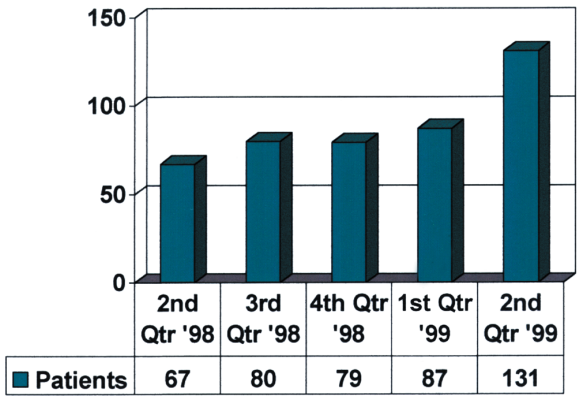

Figure 1. *Quarterly Home Touch visits.*

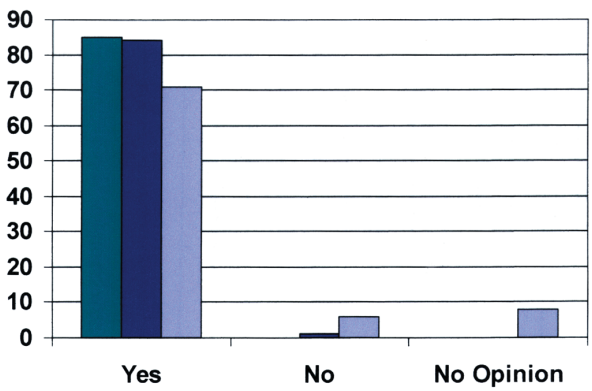

Figure 2. *Additional Home Touch satisfaction survey results. Patients were asked to rate their visit satisfaction using the following criteria: Comfortable (green). Satisfied (purple). Quality of visit okay (light purple). (n = 85 responses from 14 patients).*

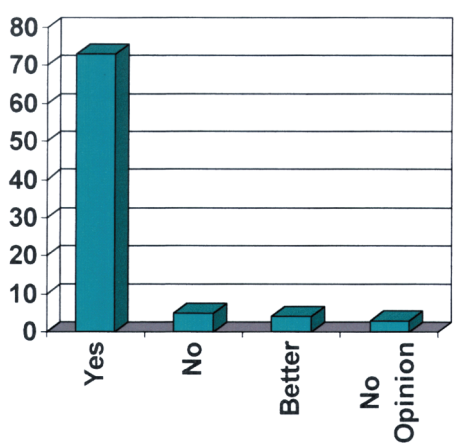

Figure 3. *Home Touch satisfaction survey results. Patients were asked if they believed the Home Touch visit was as good as a traditional visit. (n = 85 responses from 14 patients).*

taled $14,810.40 (43,560 minutes at $0.34/minute). For the 14 patients seen by telemedicine in this demonstration project, the mileage reimbursement and drive time potential savings were $49.33 per visit.

The direct cost of the Home Touch demonstration project, exclusive of nursing time, was 3% of $491,306, which is $15,539. This represents conservative utilization of 444 visits over 14 months, which is 31.7 visits per month in eight homes. If the equipment were used for 3 years, the equivalent cost per visit would be $13.62 [$15,539/(31.7 visits x 36 months)]. If the equipment were used for 5 years, the cost per visit would be $8.17 [$15,539/(31.7 visits x 60 months)]. Therefore, potential savings per visit (travel savings less equipment cost) could be between $35.71 and $41.16 in a 3- to 5-year period. These cost reduction figures could apply to a program having similar rural patient demographics and equipment costs. They may not apply in urban settings. However, one can deduce that if home health agencies supplemented a percentage of their traditional in-home visits with a low-cost, user-friendly telehome health system, cost savings related to drive time and mileage reimbursement could be seen.

Other cost savings that have yet to be calculated include those associated with reduced, nonroutine doctor visits; emergency room visits, and hospitalizations. Future research should involve evaluation of patients' medical records to determine whether patients' use of the emergency room, doctors' offices, or hospitals has increased, decreased, or remained the same during a telemedicine program.

As always, generalization from this small sample of home health patients is not possible. However, important insights about how patients received and adapted to this technology will become increasing important as policy decisions are made about the future role of telemedicine in the healthcare system, particularly in home health.

Implications for Nursing Practice

Patient and Family Caregiver Issues

Although some patients liked the telehome health visit better than an actual visit, most liked a mix of telemedicine and in-home visits. Both patients and caregivers adapted well to the technology because it was simple to use. Figures 4-7 show examples of the technology in use. Patients and caregivers came to depend on a televisit for practical clinical reasons (e.g., managing their medications); many also depended on the visit to reconnect with the "outside" world. As one patient said, "They always call when they say they will and they've never failed me yet." Patients seemed to find televisits more reliable because rarely would there be a reason for the televisit not to occur, unlike in-person home visits, which could more easily be sabotaged by weather-related driving problems. For example, one Home Touch patient needed help filling her medication box. County roads to her home in February 1999 were icy and impassable. Using the Home Touch system, the nurse was able to validate that the medication box was filled correctly.

Telemedicine afforded the opportunity to provide health education incrementally and patients appeared to be much more focused on instruction.

Telemedicine afforded the opportunity to provide health education incrementally and patients appeared to be much more focused on instruction. This probably happened because attention was more focused in the telemedicine encounter, which became routine and shorter over time. Several patients said that the nurse who visited through telemedicine was "not in such a hurry." Patients attributed this to the fact that the nurse did not have to "rush off" to the next visit, which in this rural county could be as close as 10 miles or as far away as 50.

Caregivers in particular seemed to be empowered by having help "just a phone call away." They considered the telemedicine call to be different from an ordinary phone call to the home health agency. They said the difference was the ability to see and hear the nurse, and have the nurse be able to see and hear them. Patients and caregivers said that they were more confident that medical problems could be corrected quickly because the nurse could see the situation instantly and would not have to rely only on a verbal account of what had happened as compared to a regular telephone call.

Nursing Issues

Nurses Acceptance

Home health nurses in this study generally liked Home Touch and were willing to experiment to re-

Figure 4. *A nurse evaluates a patient at home.*

Figure 5. *A patient at home discusses her condition with the Home Touch nurse.*

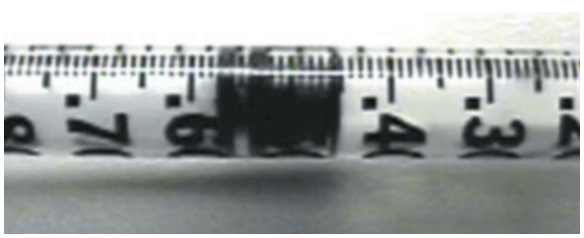

Figure 6. *Each unit on a 100-unit syringe can be seen by the Home Touch nurse.*

Figure 7. *Visualization of a wound is possible through the Home Touch system.*

solve lighting and camera angle problems. They liked having access to the patient and being able to clearly see the situation in the home. They all thought that the system was easy to use and had a variety of home health applications.

Creative Application

The ways in which telehome health can be used may only be limited by a home health agency's ability to think creatively. On-site visits often are not necessary for wound assessments, medication, or blood glucose monitoring. A nurse can observe patients checking their blood glucose or filling an insulin syringe or a medication box via telemedicine. Telehome health visits have the potential to increase patient contact at a lower cost. In capitated and per diem reimbursement situations, patients with chronic diseases may benefit from long-term monitoring via telemedicine. This can reduce costs for the agency and third-party payers while still providing quality care to the patient.

Troubleshooting

Another use for telehome health is remote monitoring or trouble-shooting equipment problems in the home. Home health agencies often receive calls regarding these kinds of problems; however, the added value of video visualization of the home equipment makes solutions at a distance more readily apparent. Substituting an on-site equipment problem visit with a telemedicine visit could cut costs for home health agencies. For example, one patient who had a mix of traditional and Home Touch visits needed to have his patient-controlled analgesic (PCA) pump adjusted to increase the dosage of pain medication. The nurse in the home did not feel comfortable making this adjustment and wanted the home care supervisor to oversee the process. The nursing supervisor was able to visually verify the new pump settings via the Home Touch system and saved the cost of an additional home visit.

Conferencing

Telehome health can provide the opportunity for an interdisciplinary conference with a patient and family caregivers. Rather than having all members of the team travel to the home, one member of the team could be at the home to facilitate and participate in the conference while the rest of team participates at a distance. Such tele-conferences have the potential of establish-

ing a better-coordinated plan of care. For example, one patient was working in the home with both a nurse and a physical therapist. His physician wanted to check the patient's progress and speak with both the patient and the family caregiver without actually going to the home. Through the Home Touch system, the physician was able to have a conference with the nurse, physical therapist, patient, and caregiver in the home without leaving the medical center.

Multidisciplinary

Other disciplines also can use telemedicine in the home. Social workers or chaplains can use the system for counseling and support. Physical therapists can observe exercise routines, gait patterns, and performance of activities of daily living. Speech therapists could use telemedicine for therapy sessions with patients in rural areas.

Summary

Results from the Home Touch demonstration project were encouraging enough that UT Home Care Services is expanding its use of the Home Touch program to the entire 16-county region that it serves through additional capital expenditures. These Home Touch visits will be provided in counties not covered by the federal grant award. In addition to continuing the use of Home Touch for nursing assessments, physicians will be encouraged to evaluate their patients at home. Additionally, access to medical specialists for rural patients will be facilitated through use of the Home Touch system.

One of the biggest challenges facing telehome health is reimbursement for the televisit. A great deal of attention has been paid to making the televisit as similar as possible to an in-person visit. Progress has been made in securing reimbursement for physicians who see patients through telemedicine clinics, and it is hoped that reimbursement commitments for telehome health will be forthcoming. Calculation of cost savings related to mileage and drive time is used solely to demonstrate that in an era of managed care and Medicare prospective payment for home care, creative use of telehealth technology may become essential to improving clinical outcomes while containing provider costs in an environment that sets reimbursement per episode.

The use of telehome healthcare through a simple telephone-television system probably will increase because patients like the simplicity and increased feeling of security. Healthcare advice and oversight becomes readily available and has helped to stimulate a sense of empowerment in most of the patients in this demonstration project. Patients and caregivers expressed a sense of relief that help was just a phone call away and felt that the kind of help available through two-way interactive telemedicine was qualitatively different from a simple telephone intervention. One caregiver said that the added value of being able to actually show the nurse the problem in the home was very significant. Most respondents said that being able to see the nurse "personalized" the encounter and many felt like the nurse was "in the same room" for all practical purposes. This feeling of being in the same room even though the encounter is mediated is called "telepresence" or "social presence." Clearly, this quality has been achieved in the Home Touch program.

In terms of potential cost savings, mileage and nurse drive time reimbursements could be reduced. Nurse productivity could be improved while maintaining high levels of patient satisfaction. These results may vary greatly depending on a home health agency's patient mix, whether it serves patients in rural areas, and the type of home telemedicine system that is used. ☗

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